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ABSTRACT

This study examined the extent to which e-mail and Internet access is available within universities in developing countries in the British Commonwealth. Data were gathered using a survey of 300 institutions in developing Commonwealth countries, and responses by 112 institutions in 19 countries were evaluated. The study concluded that a major gulf exists between developed and developing countries in communications technologies, and that a significant injection of funds will be needed if this is to be bridged. Overall, the study found Internet access has been achieved, at some level, in about a quarter of accredited university-level institutions, while e-mail access has reached about 45 percent of institutions. Generally, Internet access is more widespread in Asia, the Caribbean, and the Asian-Pacific region than in Africa. The majority of higher education institutions surveyed had achieved connectivity only within the last three years. More than 50 percent of respondents relied on analogue dial-up access via a modem, and almost half the institutions relied on common terminals (in some cases, only one) to provide Internet and e-mail for the whole university community. Appendices include the questionnaire used, a list of World Wide Web addresses, and a list of e-mail addresses. (Contains 23 references.) (DB)

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Bridging the Gap?

Internet and E mail Access within
Universities in Developing
Commonwealth Countries

HE032 109

CHEMS

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Corrected/Updated Information

Please note the following updates/corrections to the printed text.

Section 2, page 2, para. 3, l.10, should read "Dr Lucy Steward...kindly shared with CHEMS..."

Section 3.1.1, page 4, para. 2, l. 3, should read "It is interesting to note that five of the six respondents from Nigeria..."

Section 3.2, page 10, para. 2, line 8, should read "...and one medical institution (Sree Chitra Tirunal IMS 1993)."

Section 3.2, page 10, para. 3, line 6, and Section 3.4, page 13, para 3, line 3 should read "... University of Cape Coast..."

Section 3.4, page 14, para. 3, line 6, should read "...University of Agriculture, Abeokuta"

Section 3.6, pages 18-19, para. 2 (d), line 2, should read "...academic and administrative staff"

Section 3.7.2, page 23, para. 4, line 2, should read "...all heads of department and senior staff..."

Section 3.12, page 37, para. 4, line 2, should read "...constraints on higher education access to Web and e-mail are linked..."

Section 3.12, page 38, para. 5, line 2, should read "...have included, in July 1998, a workshop..."

Please note the following updates to information relating to WWW URLs and E-mail Addresses

Page 7, section 3.1.4, para. 4, should now read "This search added another 29 university-level..."

In Table C, a line has been added for Guyana, and lines for Cameroon and for the Total are now:

Cameroon	1	4	5	7	71%
Guyana	0	1	1	1	100%
Total	72	29	101	374	27%

Appendix II: WWW URLs
Added: University of Botswana: http://www.ub.bw
Added: University of Buea: http:// uycdc.uninet.cm/ed_sup/External/ universities/buea/frame.html
Added: University of Douala: http:// uycdc.uninet.cm/ed_sup/External/ universities/douala/frame.html
Added: University of Dschang: http:// uycdc.uninet.cm/ed_sup/External/ universities/dschang/frame.html
Changed: University of Yaounde I: http://uycdc.uninet.cm/ed_sup/Uy1/_uy1.html
Added: University of Yaounde II: http://uycdc.uninet.cm/ed_sup/External/ universities/soa/frame.html
No longer current: entry for Jawaharlal Nehru University (India)
Changed: University of Technology, Jamaica: http://ns.utech.edu.jm
Changed: Aga Khan University (Pakistan): only http://www.akunet.org
Added: University of Balochistan (Pakistan): http://www.geocities.com/Tokyo/7507/uob.html
No longer current: entry for Bahauddin Zakariya University (Pakistan)
Changed: Ziauddin Medical University (Pakistan): http://www.geocities.com/CollegePark/7329/
Changed: Uganda Martyrs University: http://www.fiuc.org/umu/umu.html
Added: University of Zimbabwe: http://www.uz.ac.zw/

Appendix III: Institutional and Vice-Chancellors' E-mail Addresses
Changed: Deccan College: deccan.college@gems.vsnl.net.in and dakshina@pn2.vsnl.net.in
Changed: Gandhigram Rural Institute (India): (general) gricc@dindgul.tn.nic.in
Changed: Gujarat Vidyapith: (second address): gvpahd@ad1.net.in
Added: University of North Bengal: (Registrar) tkc@shivanet.com

COMMONWEALTH
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Bridging the Gap?

Internet and E-mail Access within Universities in Developing Commonwealth Universities

by
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September 1998

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Preface

The General Conference of the Association of Commonwealth Universities in Ottawa in August 1998 considered the question of new technologies in higher education, sparked by a presentation from Nortel, a multinational high technology and communications company. The discussion after the paper showed that we have two worlds. It was obvious that on this topic the Commonwealth is very clearly divided between those with access to the technologies and those for whom it is a dream or an imperfect reality.

This thought was in our minds when we undertook this survey at the suggestion of the Commonwealth Secretariat. Although we have no financial cures or obvious remedies to the problem, we aim to identify the extent of the "technology poverty gap". Our hope is that we can show the current position in each of the main Commonwealth countries as regards their possession of e-mail and Internet access and their plans to acquire or extend such access.

We hope that the report achieves this aim. Given that we undertook the study in only three months (inevitable if we are to get a good snapshot in an area which changes rapidly), we had a reasonable response rate of 37% to our survey. Thus, our findings cover 112 developing country institutions in 19 countries.

The picture which emerges is a patchy one. There are some areas of relative happiness such as Mozambique, Zambia, Botswana, Mauritius, the University of the West Indies and the University of the South Pacific which compare well with the position in parts of India or Nigeria. However, when we looked deeper at the coverage to find out how many terminals in each university were able to access e-mail and Internet and how many staff or students could make use of it, we found that the position was not always favourable. There were several institutions where access is limited to the library and the Vice Chancellor's Office; similarly, we found that 29 of the 72 institutions with Internet access were using analogue telephone lines which severely limit their speed of access to data and the communications potential.

The conclusions are clear: that there is a major gulf between developed and developing countries in communications technologies and that a significant injection of funds will be needed if this is to be bridged. Since we have no earlier survey and no benchmark for the position in developed country institutions, we cannot know whether this gulf is growing wider or staying the same. A likely assumption is that it will continue to grow, given the push in the developed world for universal student access to personal computing facilities.

Higher education providers in developed countries take for granted the availability of the Internet and e-mail access for their staff and students. The effect of this on the quality of the learning experience is not clear. However, there are indications that it is becoming crucial to student-centred learning. As this trend develops, the gulf between their life and those of students in developing country institutions will become apparent. This will add to the differences which already exist in terms of access to scientific equipment and

information resources. Those transferring between systems "from south to north" are going to face even greater entry problems when they move to a northern institution.

We have identified the size of the problem. We hope that policy makers will act urgently.

John Fielden
Director
CHEMS

1. Introduction

Within the last decade, access to e-mail and the Internet has transformed the face of higher education within developed nations. Communication, via e-mail, has become faster, more cost-effective, and less formal, promoting networking. The growth of e-mail discussion groups allows academics and university managers to share information and solve common problems with their counterparts and colleagues, be they on the other side of the campus, or on the other side of the world, with equal ease. The UK's AUA Mailbase system alone currently contains more than 2,000 such special interest groups, ranging from academic/industry relations to X-ray spectroscopy.

Libraries, formerly hard-pressed to meet the rising cost of paper journals, have found their burdens eased with cheaper access to a vast range of electronic journals. Academic researchers and students can obtain, in minutes, information which previously would have required a trip to a specialist library or a wait of several hours or days, while material was brought up from the stacks or ordered on loan from another library. Physicists, for example, now have access, via the Web, to the wealth of articles contained in the Los Alamos pre-print archive.[1] University administrators, seeking models of good practice, can tap into the growing stock of policies and procedures which HEIs are now publishing on their Web pages; a recent count by CHEMS showed that more than 60 Commonwealth universities now include such documents on their Websites, not to mention those in the US and elsewhere.

Last, but certainly not least, there is the rapid growth in the development of on-line courses and the advent of the "virtual university". This phenomenon is already, of course, transforming the whole concept of 'distance education'. More importantly, it is effecting a fundamental shift as to what constitutes the 'catchment area' to which any one institution looks for the make-up of its student body.

For universities in developing countries, the Internet, which offers cheaper, faster and more reliable communication, access to the latest research papers, and to models of managerial good practice, would appear to present a great opportunity.

On the other hand, these technologies could present a considerable threat to developing country HEIs.[2] If they are not able swiftly to gain access to these communication, teaching and research tools, there is the danger that the North-South gulf between HE systems will grow ever wider. Also, it might be feared that if institutions are not able to offer such facilities, students in developing countries could find the attractions of the latest on-line course from a US institution more alluring than study at the local campus.

2. Survey Methodology and Data Sources

This survey, which was carried out between May and July 1998, set out to discover the extent to which e-mail and Internet access is available within universities in developing countries in the Commonwealth, when such use began, who has access to these tools within each institution, whether access is linked to the possession of campus or institution-wide computing networks, and what the plans are for future expansion of such facilities in these countries.

To this end, a 5-page questionnaire (attached as Appendix I) was sent to approximately 300 institutions in developing Commonwealth countries. Because time allowed for the survey was fairly limited, the choice of institutions was determined largely by those which could be contacted successfully by fax (and to a lesser extent, e-mail). In Africa, the CHEMS Representative, Professor Philip Githinji, included a question on e-mail and Internet access in a circular sent to 21 institutions.

In addition, information on WWW access was sought via the lists of university Websites collected by the Association of Commonwealth Universities (whose database also provided details of Vice-Chancellors' and institutional 'mailbox' e-mail addresses), those on the Universities and Colleges Home Pages site maintained by Christina de Mello at MIT in the US[3] and the country lists maintained on the higher education section of the Website of the search engine company, Yahoo.[4] Information on the situation in Africa was sought from the Internet Service Provider (ISP), GreenNet, from Mr Zoumana Bamba at the Association of African Universities (AAU) and from Mike Chivhanga at the Internet Access Group on Africa. Dr Lucy Steward at the Commonwealth Secretariat has kindly agreed to share the results of an IT access survey focused on 'small state' institutions; this information will be added when it becomes available. Data was also collected via secondary literature and from relevant Websites.

CHEMS is very grateful for the help of everyone who responded to the survey questionnaire or sent information. Thanks are also due to Anna Protano-Biggs who carried out the initial analysis of the survey responses, and to Mike Brodbelt, IT Manager at the Association of Commonwealth Universities (ACU) for technical advice.

3. The Survey Results

Of the 300 universities which were sent a questionnaire, replies were received from 112 institutions, representing a response rate of 37 percent. Several respondents made comments to the effect that they considered the survey topic interesting and worthwhile. One Indian respondent, which planned to acquire an Internet connection in the near future, said that they hoped that this "may help us grow". Another Indian institution and one in Pakistan told CHEMS that to make statistics available on this subject was "a very good attempt" and "very useful". One Indian Vice-Chancellor passed the questionnaire onto the IT director for completion, with the message that "this is very important".

Thirty institutions (27 percent of respondents) sent their replies by email. 16 of these were Indian institutions, plus four from Sri Lanka, two from Pakistan, and one each from Cameroon, Kenya and the South Pacific. It is interesting to note that all five respondents from Nigeria, where postal and fax communication tends to be particularly slow and/or unreliable, chose to send their responses by e-mail.

Brief replies were also received from four African institutions, in response to the query sent by the CHEMS Representative for that region, one of these had also returned their questionnaire. Three of the institutions who replied, however, (one in Bangladesh, two in India) either failed to enclose the questionnaire with their reply, or to send one that was readable, and have not yet sent the requested copy or replacement. The data analysed below is, therefore, based on results of 112 useable replies, divided by country as shown in Table A, below.

Table A

Commonwealth Country/Region	Number of Responses
Bangladesh	1
Botswana	1
Cameroon	1
Ghana	4
India	59
Jamaica	1
Kenya	6
Lesotho	1
Mauritius	1
Mozambique	2
Nigeria	6
Pakistan	10
Papua New Guinea	2
South Pacific	1

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Sri Lanka	5
Tanzania	1
Uganda	2
West Indies	1
Zambia	1
Total	**112**

3.1 Internet and E-mail Access

3.1.1 The first question asked whether the university had an Internet connection (i.e. access to the World Wide Web and other services). As can be seen from Table B, below, 74 (66 percent of respondents) said yes. All the Pakistan respondents had an Internet connection, as did 40 Indian institutions (68 percent of respondents from that country). For Bangladesh, the percentage of respondents with access to the Internet is lower (three institutions, 43 percent), but a fourth institution was in the process of acquiring an Internet service.

It is notable that the majority of the 38 which did not yet have Internet access are African institutions: only one in four Ghanaian respondents and one in six of those from Nigeria had a Web connection, only two of the six Kenyan institutions who replied had access. Mr Zoumana Bamba, at the Association of African Universities (AAU) cited four factors militating against full utilisation of the Internet by African universities:

- the cost of computers;
- very poor interconnectivity in semi-urban areas, because the cost of installing a lease line is very high (the University of Cape Coast in Ghana paid $8,000);
- the absence of local Internet Service Providers (ISPs) in semi-urban areas: this prevents most Nigerian universities from achieving full connectivity;
- a lack of awareness among African university administrators of the necessity to be connected to the Internet.

Karen Banks at GreenNet, which acts as an e-mail service provider for a number of African universities (see below), confirmed that while many African universities have e-mail, "almost none have access to WWW". Of the exceptions, she cited Eduardo Mondlane University in Mozambique as "one of the heralded success of Internet in Africa", the University of Dar es Salaam in Tanzania and the University of Zambia were the others most likely to be enjoying reasonably good access to the Internet.

In response to this situation, the AAU is hoping to promote the use of Internet resources among its members, by means of seminars for academics on using the Internet to improve the quality of teaching and research, and the training of university

librarians in the use of the Internet and how to offer Web-based library services. Funding for these activities is, however, still being sought.

Table B

Commonwealth Country/Region	No. of Responses	Institutions with Internet Facilities (including e-mail)	Institutions with E-mail Facilities only
Bangladesh	7	3	4
Botswana	1	1	0
Cameroon	1	1	0
Ghana	4	1	3
India	59	40	12
Jamaica	1	1	0
Kenya	6	2	3
Lesotho	1	1	0
Mauritius	1	1	0
Mozambique	2	1	1
Nigeria	6	1	4
Pakistan	10	10	0
Papua New Guinea	2	2	0
South Pacific	1	1	0
Sri Lanka	5	3	1
Tanzania	1	0	1
Uganda	2	1	1
West Indies	1	1	0
Zambia	1	1	0
Total	**112**	**72**	**30**

Thirty institutions (27 percent of respondents) said that they did not as yet have Internet facilities, but had access to e-mail facilities only. As can be seen from Table B above, this applied to 12 Indian respondents, four Bangladeshi and four Nigerian institutions, three each from Ghana and Kenya, and one each from Sri Lanka, Tanzania, Uganda and Mozambique.

3.1.2 When asked, however, whether they had plans to acquire an Internet connection, and the percentage of terminals likely to have access, the response was as follows:

- three institutions in Bangladesh gave their lead times for getting Internet access as, respectively, six months (access via all terminals), one year (via 40 terminals), two years (via 50 percent of terminals)

- the two relevant Ghanaian institutions hoped to have access by: the end of 1998 (60-70 percent of terminals), by 1999 (50 percent of terminals)

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- in India, of 19 institutions without Internet access, six planned to have Internet access within 1-4 months of their survey response, with one stipulating that all departments would be able to use it via networking, while in another, 80 percent of terminals would have access; a further four said they hoped to be connected within the next six months: two of these stipulated access for 15 and 21 terminals, respectively, though another planned only for access via one common terminal; five other institutions had longer lead times (within the next nine months; a year; campus-wide access "by March 1999"; "full access by the end of the year 1999-2000"; within the next three years). One institution, however, in this last group was apparently still looking for funds to implement this plan. Two said they would have access "very soon" and "in a short time"; another planned for 70 terminals to have access "shortly". One institution gave no details of planned acquisition or timescale

- in the three Kenyan institutions affected, one planned for 200 terminals to be connected to the Internet by the end of 1998; in another the issue of acquiring facilities was still under discussion; in the third, it was hoped that there would be access for all terminals by the end of 1999, but this was dependent on obtaining funding for a campus computing network

- in Mozambique, the University of Education plans to have three terminals linked to the Internet by the end of 1998

- in Nigeria, however, obtaining Internet access was dependent in three of four cases on funds being available, a fourth institution was waiting for Nigeria to get its own 'gateway'; the fifth did not mentions any plans to acquire access

- in Sri Lanka, one of the two institutions affected was taking action that would provide for Internet access (initially via the library and then the Vice-Chancellors' office) within the "next few months"; the other planned for 5 terminals connected to the Internet, but without specifying a timescale

- in Tanzania, plans for the Open University to get Internet access are, again, dependent on funds becoming available

- Mbarara UST in Uganda, is planning Internet access through local hosts such as Infomail and Starcom Uganda Ltd, but financial problems are likely to stand in the way of acquiring the necessary software, technical services and staff training

3.1.3 Only 10 institutions (9 percent of survey respondents) effectively had neither Internet nor e-mail facilities: one in Kenya, one in Nigeria, one in Sri Lanka and seven in India. Of the latter, Dr Babasaheb Ambedkar Open University was still in the process of developing its infrastructure facilities, while at Maharaja Sayajirao

University of Baroda, very limited e-mail facilities were restricted to the department running the MCA course. In Sri Lanka, Buddhist and Pali University was only able to send its survey response via the Librarian's home computer.

All but three of these 10 institutions, however, expressed the intention of acquiring access to e-mail and/or Internet facilities; five gave time-scales ranging from two to 12 months for planned implementation.

3.1.4 In addition to the survey responses, information on the number of universities in developing Commonwealth countries with Internet and/or e-mail access can be adduced from the lists of university Websites collected by the ACU, by Christina de Mello at MIT, and on the Yahoo Website. Some of these sites may, however, not be 'official' in the sense of being launched by the University's central administration; one Indian institution with an URL listed on the de Mello site told CHEMS that it did not have an Internet connection as yet.

This search added another 24 university-level institutions with Internet access to our data, divided by country as follows:

Table C

Country/ Region	Institutions with Internet Connectivity (from CHEMS survey)	Institutions with Internet Connectivity (based on WWW URLs from other sources)	Total	Number of University-level Institutions in Country (a)	% of University-level Institutions in Country known to have Internet Connectivity
Bangladesh	3	3	6	15	40%
Botswana	1	0	1	1	100%
Cameroon	1	0	1	7	14%
Ghana	1	1	2	5	40%
India	40	13	53	229	23%
Jamaica	1	0	1	1	100%
Kenya	2	0	2	8	25%
Lesotho	1	0	1	1	100%
Mauritius	1	0	1	1	100%
Mozam-bique	1	0	1	2	50%
Nigeria	1	1	2	37	5%
Pakistan	10	1	11	36	31%
Papua New Guinea	2	0	2	5	40%
South Pacific	1	0	1	1	100%
Sri Lanka	3	2	5	14	36%
Tanzania	0	1	1	3	33%
Uganda	1	1	2	5	40%
West Indies	1	0	1	1	100%

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Zambia	1	1	2	2	100%
Total	**72**	**24**	**96**	**374**	**26%**
(a) Based on institutions eligible for inclusion in the 1998-99 *Commonwealth Universities Yearbook*					

In addition, in India, Websites are listed (on the De Mello and Yahoo pages) for around 65 institutions, which are either colleges affiliated to one of the universities, or private foundations.

Website numbers may, however, provide only a conservative estimate of the extent to which developing country institutions are connected to the Internet. Replies to the survey showed that not every institution which had acquired an Internet connection had immediately, or necessarily, launched its own Web pages. Of the 72 institutions with an Internet connection, only 47 (65 percent) provided details of their WWW URL, divided by country as follows:

Table D

Country	No. of institutions with Internet connection	No. of institutions with WWW URL
Bangladesh	3	3
Botswana	1	1
Cameroon	1	1
Ghana	1	1
India	40	20
Jamaica	1	1
Kenya	2	1
Lesotho	1	1
Mauritius	1	1
Mozambique	1	1
Nigeria	1	0
Pakistan	10	8
Papua New Guinea	2	2
South Pacific	1	1
Sri Lanka	3	3
Uganda	1	1
West Indies	1	1
Zambia	1	0
Total	**72**	**47**

The other two Pakistan respondents said that their site was under construction, as did two of the Indian institutions without an URL. Two other Indian universities said that a Website was not yet designed/applicable. Some respondents appeared

not to understand what information was being requested at this point. A full list of WWW URLs for the institutions listed in Table D is included in Appendix II.

In addition to the 102 survey respondents with e-mail facilities (either via their ISP or an independent provider), information supplied to the Association of Commonwealth Universities' database, and published in the *Commonwealth Universities Yearbook*, shows that e-mail facilities, consisting at least of a general e-mail 'mailbox' exist at a minimum of another 66 institutions. These are divided by country as shown in Table E:

Table E

Country/Region	Institutions with E-mail (CHEMS survey)	Additional Institutions with E-mail (ACU database)	Total	Number of University-Level Institutions in Country	% of University-level Institutions in Country known to have E-mail Facilities
Bangladesh	7	4	11	15	73%
Botswana	1	0	1	1	100%
Cameroon	1	0	1	7	14%
Ghana	4	1	5	5	100%
India	52	38	90	229	39%
Jamaica	1	0	1	1	100%
Kenya (a)	4 (b)	3	7	9	78%
Lesotho	1	0	1	1	100%
Malawi (a)	0	1	1	1	100%
Mauritius	1	0	1	1	100%
Mozambique	2	0	2	2	100%
Namibia	0	1	1	1	100%
Nigeria (a)	5	7	12	37	32%
Pakistan	10	5	15	36	42%
Papua New Guinea	2	0	2	5	40%
South Pacific	1	0	1	1	100%
Sri Lanka	4	2	6	14	43%
Swaziland (a)	0	1	1	1	100%
Tanzania	1	1	2	3	60%
Uganda (a)	2	2	4	5	80%
West Indies	1	0	1	1	100%
Zambia (a)	1	1	2	2	100%
Zimbabwe (a)	0	2	2	3	67%
Total	**101(b)**	**69**	**170**	**378**	**45%**

a) Additional information from the ACU database and/or from Mr Zoumana Bamba at the AAU

b) 5 Kenyan institutions with e-mail access sent responses to the survey, but one of these (Scott Theological College) is a private institution (i.e. without an entry in the *Commonwealth Universities Yearbook*), and as such has been omitted from the statistics in this table

Full details of institutions and e-mail addresses are given in Appendix III.

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3.2 When was Internet and E-mail Connectivity Achieved?

Institutions were asked to give the year in which their institution first acquired access to Internet and e-mail facilities.

Within India, the majority of the 40 institutions with Internet access acquired it within the last three years (11 in 1998; 11 in 1997; nine in 1996). The first institution among our Indian respondents to get a Web connection was the Indian Institute of Technology, Bombay, as early as 1987, followed by the Indian Agricultural Research Institute in 1990. Others with an Internet connection in the early 1990s comprise three science and technology-focused institutions (Indian Institute of Science, Bangalore 1992; Birla ITS, Pilani 1993; the Indian Institute of Technology, Kanpur 1993) and one medical institution (Sree Chitra Tirunal IMS). Indira Gandhi National Open University (IGNOU) and two less specialised institutions, Punjabi University and the University of Kerala, followed suit in 1995.

Within the other countries featured in the survey, the earliest access to Internet facilities was achieved in 1990 by the University of Moratuwa in Sri Lanka, followed in 1992 by Eduardo Mondlane University in Mozambique and the University of the South Pacific; the latter got its link via New Zealand. The University of the West Indies acquired Internet access in 1994, thus extending the capability also to The University of Technology, Jamaica. Cape Coast University in Ghana followed in 1995.

The second half of the 1990s sees access to the Internet extended to institutions in Bangladesh (one in 1996, two in 1997), Lesotho and Mauritius (1996). Of the 10 Pakistan institutions with Internet access, Lahore University of Management Science was the first to get connected, in 1996, followed by three science and technology-focused institutions and one medical university in 1997; the other five only got access in 1998.

Where institutions acquired e-mail independently of their Internet service, or have only e-mail facilities as yet, the picture is as follows:

In India, acquisition of e-mail facilities generally precedes Internet access by between one and three years, in one case by five years. Of the 10 institutions to which this applies, two got their connection in 1993, four in 1995, two in 1996 and two in 1997. Ten of the 12 with e-mail access only acquired it between 1994 and 1998; two did not specify the year.

In Bangladesh, North South University got e-mail in 1995, two years before its Internet connection; three of the four institutions with just e-mail acquired it in 1996 or 1997; the other did not specify the date. The three Ghanaian institutions with e-mail facilities alone got linked up in 1995 and 1996. Mbarara UST in Uganda also got e-mail in 1996, as did the General Sir John Kotelawala Defence Academy in Sri

Lanka. The Sri Lankan University of Kelaniya had e-mail in 1993, four years before its Internet connection. In Pakistan, two engineering and technology-focused institutions got e-mail facilities (in 1996 and 1997) the year before they acquired a full Internet connection. A gap of four years passed between acquisition of e-mail at the National University of Lesotho (in 1992) and its link-up to the Internet. Of the four Nigerian institutions without an Internet connection, one acquired its email facilities in 1996, two in 1997 and one in 1998.

It is clear from these results that the second half of the 1990s has seen the rapid expansion of access to Internet and e-mail facilities within universities in all the developing Commonwealth countries which responded to the survey. Those institutions which do not yet have access are clearly keen to acquire these facilities in the near future.

3.3 Quality of User Experience and Service

It is not enough, however, merely to state the numbers of institutions in developing countries with Internet connectivity. In order to assess whether higher education systems within these regions are really beginning to share the benefits, in terms of aids for teaching, research, and administration, that are enjoyed by university staff and students in higher-income nations, it is necessary to consider how widely these facilities are available within the institution, and the quality of service (e.g. reliable connections, speed of searching and downloading material) that users are likely to experience.

Institutions were asked to indicate what mode of access they had to the Internet, from the following options:

(a) Dial-up access using a modem and an analogue phone line (speed limited to 33.6 Kbps)

(b) Dial-up access using a digital phone line (eg ISDN, ADSL) (speed of 64-128 Kbps)

(c) Leased line (permanently connected digital carrier circuit with speed from 64 Kbps to 2 MBps).

In terms of speed and convenience of use, there are considerable differences between these three systems. Using an analogue modem (a), about 3.5 kilobytes of data can be downloaded per second. By comparison, a 64 Kbps digital line (b) has just under double the bandwidth of a modem, but is "much more than twice as responsive"; the difference in performance has been compared to the difference between driving a Porsche and a Mini![5] When it comes to downloading material from the Web, the difference between option (a) and option (c) is dramatic: it takes less than a minute to

download 10 Megabytes of data using a 2 Mbps leased line, whereas using an analogue modem, it would take just over 45 minutes.

The replies are summarised in Table F, below. It can be seen that the total figures for (a), (b) and (c) exceed the number of responses, because in a few institutions, more than one mode of access to the Internet is employed, e.g. All-India Institute of Medical Sciences has both (a) and (b).

It is encouraging to see that just over half of all institutions which responded (52 percent) access the Internet via option (c), a leased line, which delivers the fastest service. The second largest group, however (38 percent of institutions) are using option (a), dial-up access using a modem and an analogue phone line. Only 10 percent of institutions employ the middle option (b), dial-up access using a digital phone line.

Within the different countries, 52 percent of Indian respondents get the superior service that comes from using a leased line, in Pakistan, institutions are divided half and half between analogue dial-up and leased line, with one institution using two options. In Bangladesh, two respondents use dial-up access via a digital phone line, the other relies on option (a). It is not surprising to note, in light of the comments by Zoumana Bamba of the AAU, above, that the majority of African respondents (seven, 64 percent) have to make do with analogue dial-up access; respondents in Botswana, Cameroon, Mauritius and Mozambique do, however, have the more sophisticated option (c). By contrast, all respondents from the Asia-Pacific region and the West Indies enjoy access via a leased line, as do the three Sri Lankan respondents.

Table F

Country/ Region	Number of Institutions with Internet	Number of Institutions with (a)	Number of Institutions with (b)	Number of Institutions with (c)
Bangladesh	3	1	2	0
Botswana	1	0	0	1
Cameroon	1	0	0	1
Ghana	1	1	0	0
India	40	16	5	23
Jamaica	1	0	0	1
Kenya	2	2	0	0
Lesotho	1	1	0	0
Mauritius	1	0	0	1
Mozambique	1	0	0	1
Nigeria	1	1	0	0
Pakistan	10	5	1	5

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Papua New Guinea	2	0	0	2
South Pacific	1	0	0	1
Sri Lanka	3	0	0	3
Tanzania	0	0	0	0
Uganda	1	1	0	0
West Indies	1	0	0	1
Zambia	1	1	0	0
Total	**72**	**29**	**8**	**40**

3.4 ISPs

Institutions were also asked to name their Internet Service Provider (ISP). Of the three Bangladeshi institutions with current Web access, Chittagong University uses a company based in that city called Spectranet (spctnet.com), while North South University uses Information Services Network (ISN) in Dhaka, the latter was named also by Bangladesh Open University, but it also gets services via Grameen Cybernet. The University of Rajshahi is also in the process of obtaining Web access from Grameen Cybernet (a joint venture between the Grameen Bank and CITech Co Ltd), since its current e-mail service provider "cannot handle FTP and other modern Internet facilities".

The Bangladesh Network Resource Locator, which describes its Web pages[6] as "an ongoing and ever-changing repository of Internet connectivity in Bangladesh" includes these ISPs in a list of eleven for Bangladesh. ISN was apparently the first company in Bangladesh to have an on-line connection to the Internet, followed by Grameen Cybernet. Customer survey responses to the service provided by these ISPs are included on the BNRL Website. Neither Grameen or ISN fares all that well, each logging an overall satisfaction rate of 2 (where 10 signifies "extremely satisfied" and 1 means "not at all satisfied"). Problems included occasional trouble connecting to the Internet, and in the case of ISN, poor customer support. Four of the eight Grameen users surveyed had considered changing provider, as had three of the four ISN users. all cited the wish to pay less as a reason for considering a switch and all (Grameen) or most (ISN) the need for better service, support and faster speeds, the desire "to get fewer busy signals" seemed to be a less pressing problem. Both the other ISPs listed on this site where customer feedback is available (Kaifnet Services and Pradeshta Net) score better than the ISPs used by the universities, though the number of survey responses in each case is very small. No customer feedback is available yet for Spectranet.

The University of Botswana gets its Web access via the Botswana Telecommunications Corporation, and the University of Yaounde I in Cameroon uses INTELCAM. The one Ghanaian respondent with Internet access, Cape Coast University, uses a company called Network Computer Systems.

In India, four different ISPs serve our 40 respondents with Web access: the most popular is Videsh Sanchar Nigam Ltd (VSNL), used by 18 institutions; 16 institutions named the Education and Research Network (ERNET), described as an autonomous body under the Department of Electronics, Government of India; the National Informatics Centre (NICNET), India is used by nine institutions; one university gets its Internet facilities via Software Technology Parks of India (STPI). The total figure here comes to more than 40 because a few institutions use more than one ISP. One institution using NICNET, however, commented that the "service is not satisfactory [as the] system [is] off-line most of the time"; consequently the institution was getting a VSAT connection to NIC in Delhi. Andhra University, which uses VSNL, also reported that they were currently in the process of getting a VSAT linkage, via the National Institute of Oceanography, "which will allow better access" and allow the university to "offer more Internet services and Website browsing to our users".

The University of Technology, Jamaica gets its Internet connection via the University of the West Indies at Mona, which names its ISP as Cable and Wireless (JA) Ltd.

In Kenya, the University of Nairobi gets its link via Formnet Africa, while Maseno University College uses the African Regional Centre for Computing in Nairobi. Both the National University of Lesotho and Eduardo Mondlane University in Mozambique use the services of the Rhodes University node in South Africa (UNINET-ZA). The University of Mauritius gets access via Telecom Plus. The one Nigerian respondent with Internet access, the University of Agriculture, Abuja uses the Ibadan-based company Skannet (via UUNET).

Eight different ISPs are named by the 10 Pakistan respondents: Mehran University of Engineering & Technology and NED University of Engineering & Technology in Karachi get Web access via PTCL, but the latter will be changing to Pak Data Com in future. COMSATS (Commission on Science and Technology in the South) acts as ISP for the Sir Syed University of Engineering & Technology (also in Karachi) and for Ghulam Ishaq Khan Institute of Engineering Sciences & Technology. Both Shaheed Zulfikar Ali Bhutto Institute of Science & Technology and Ziauddin Medical University use Compunet Online. Aga Khan University uses both IBM Pakistan and UUNET, while Bahauddin Zakariya lists the appropriately-named brain.net.pk. The University of Agriculture, Faisalabad names paknet1.ptc.pk as its ISP, Lahore University of Management Sciences operates its own Internet access.

The University of Papua New Guinea gets its Internet connection via Online South Pacific; Papua New Guinea University of Technology runs its own service via Melbourne University. Similarly, the University of the South Pacific now operates its Web link via Fiji Telcom, but got its original linkup (in 1992) via New Zealand. In Sri Lanka, the University of Colombo uses Sri Lanka Telecom, while the universities of Kelaniya and Moratuwa access the Web via the Lanka Educational and Research Network (LEARN). Uganda Martyrs University obtains its Internet link using

INFOCOM; Copperbelt University uses ZAMNET, which is an ISP wholly owned and operated by the University of Zambia.

3.5 E-mail Service Providers

The 30 institutions with e-mail, but not Internet facilities, were also asked to give details of their service provider. In addition, four universities (one each in Bangladesh, Kenya, Lesotho and Pakistan) were using an e-mail service which was independent of their ISP.

The responses were as follows:

- five different service providers are used by universities in Bangladesh: Proshika Computers, Dhaka (Khulna University), Information Services Network Ltd (ISN) (Jahangirnagar), Agni is used by North-South University (instead of its ISP) and by Shahjalal University of Science & Technology; Rajshahi University uses a company called Drik Alok Chitra Granthagar Limited

- the field in Ghana seems to be dominated by the UK-based service provider, GreenNet, which was cited by the University for Development Studies and University College of Education, Winneba, the latter gets its access via the library of a larger institution, the University of Ghana. The University of Science & Technology, Kumasi named its provider as FIDONET, but the e-mail address given suggests a link between this company and GreenNet

- in India, the most widely-used providers for e-mail are the national network ERNET, run by the Government of India's Department of Electronics, used by eight institutions, three of them use this provider instead of or in addition to their ISPs. The National Informatics Centre (NIC) was cited by seven institutions, in two cases utilised instead of the ISP. Two universities use Dartnet for e-mail services, in one instance, instead of its ISP. Another uses VECC-CAL in addition to its ISP. VSNL was cited by two universities. One university had been using Adinet services for the past three years, apparently in tandem with the services more recently acquired via their ISP. One medical institution uses the commercial provider Yahoo

- in Kenya, Moi University uses Africa Online, the African Regional Centre for Computing (ARCC) provides Maseno University College with e-mail services. Egerton University cited Net 2000 and the University of Nairobi uses Nairobi Net for e-mail services in addition to its ISP; Scott Theological College has to rely on the home computer of a member of staff using a company called aimint.org

- the National University of Lesotho acts as its own service provider for e-mail

- in Mozambique, the University of Education gets its e-mail services via Eduardo Mondlane University, which itself uses UNINET

- in Nigeria, it is interesting to note that the University of Abuja and Abubakar Tafawa Balewa University are provided with e-mail services by the International Centre for Theoretical Physics (ICTP) in Trieste, Italy, via an arrangement with the Nigerian National Universities Commission (NUC). Jos University also cited NUC as well as Skannet in Ibadan; the University of Nigeria uses one of the leading commercial service providers, America Online (AOL)

- in Pakistan, Mehran University of Engineering and Technology uses a provider called Supernet for e-mail, instead of its ISP

- Sri Lanka provides another example of a small institution getting its e-mail services via a larger university. General Sir John Kotelawala Defence Academy accesses the national academic network, LEARN, via the Engineering Faculty at the University of Moratuwa

- The Open University of Tanzania has one of its two terminals linked to the African Virtual University Project

- Mbarara University of Science and Technology gets e-mail services from Healthnet Uganda Ltd

3.6 Extent of Access within Institutions to Internet and E-mail Facilities

If one were to assume that even within the 112 institutions which responded to the CHEMS survey, access to Internet and e-mail facilities was available to all staff, then the population which would benefit from these new technologies would be in the region of 52,000. If all students within these universities were able to use e-mail and had access to the Web, then another 600-700,000 individuals[7] would experience faster and easier communication and improved access to up-to-date research data.

To determine, however, what is actually meant, in terms of the experience for staff and students, when a university in a developing country says that it has Internet access and e-mail facilities, CHEMS asked institutions to define exactly which sections of the university community had use of these facilities.

Institutions were asked approximately how many computer terminals they had, for use by staff (academic and administrative) and students, and how many of these terminals could be used to access e-mail and Internet services. In summary, the position is as follows:

- in Bangladesh, one university has very limited access for academic and

administrative staff (less than 5 percent of available terminals), one theoretically gave access to all staff and students, but via 2 terminals only; the third had one terminal for all levels of user

- at the University of Botswana, 80 percent of 950 terminals in total give Internet access to staff and students

- in Cameroon (University of Yaounde I), 60 percent of terminals for academic staff, 40 percent for administrative staff and 25 percent for students (350 terminals in all) have Internet access

- at the University of Cape Coast in Ghana, 13 percent of computers used by academic staff, but only 3 percent used by administrators have access (61 terminals in all); students only have access via the Computer Department terminal

- of 40 institutions in India

  a) five institutions (35, 50+, 150, 300 and 2000 terminals respectively) have all staff terminals linked to the Internet (in four cases, there is also full access to students)

  b) in another 16 institutions, access is via a smaller number of shared terminals (1-20 depending on the institution), sometimes located in the library; in most cases these are open to the whole university community

  c) aside from (a) and (b) above, three institutions have 50-67 percent of terminals for academic staff linked up; in another eight, the access level is 20-45 percent; two institutions give access to approximately 15 percent of academic staff; in four universities, only 4-7 percent of terminals used by academics have access to the Web; in two institutions, there is no access for academic staff at all

  d) aside from (a) and (b) above, access for administrative staff ranges from around 50-70 percent of terminals (three institutions), around 30-40 percent (four universities); in four institutions, access for administrators is limited to between two and 10 percent of terminals; in eight institutions (20 percent), there is no access for administrative staff at all

  e) student access is generally more limited, aside from (a) and (b) above, and one institution where student Internet access (100 percent of 40 terminals) is very much better than that for staff. Three institutions have 50-80 percent of student terminals linked up; three have a 30-40 percent access level for students; 20-25 percent of terminals are connected in two universities; in another five, less than 10 percent of student terminals give

access to the Internet; in five institutions, there is no student access to Internet facilities at all

- at the University of Technology, Jamaica, twenty percent of the 100 terminals for administrative staff have Internet access, but while there are 400 terminals for academics, only five of these are hooked up to the Internet. Students do better, being able to access the Internet through 28 percent of their 200 terminals

- in Kenya, all staff have Internet access in one institution, but only 5 terminals are involved; there is no student access. At the other institution nearly 40 percent of student terminals are connected, 10 terminals for academic staff have access, but it is not clear what percentage of total terminals this represents; there is no Internet access via terminals used by administrative staff

- at the National University of Lesotho, 100 terminals used by academic staff (50 percent) have Internet access, there are 50 terminals for administrators and 80 percent of these are connected to the Internet. There is some student access, but the precise information could not be read on the questionnaire

- The University of Mauritius provides Internet access via 85 percent of 200 terminals for academic staff and via half the 250 allotted to administrators, only 9 percent of student terminals, however, provide Internet access

- in Mozambique, at Eduardo Mondlane University, with 175 terminals in total, staff and students have access to the Internet in roughly equal measure (via 7-8 percent of terminals in each group)

- the one Nigerian respondent with Internet access, the University of Agriculture, Abeokuta, offers access to everyone via one server; the number of terminals was not stated

- of 10 respondents from Pakistan

  a) four have all staff terminals (numbers range from nine to 200+) connected to the Internet (with the exception of secretarial staff in one case); three of these provide access to all students

  b) two institutions offer access to everyone, but via only one terminal in one case and five in the other

  c) one institution provides Internet access only to two of 12 terminals used by administrative staff

  d) one university has 20 percent of the 75 terminals used by academic and

administrative connected to the Internet, 16 percent of the 225 student terminals have access

e) in another institution, only 2 percent of 254 terminals for academics permit Internet use; administrators do rather better, with 11 percent of 176 terminals connected to the Internet, while 17 percent of 30 student terminals have access

f) all students and academic staff in another institution can access the Internet via one terminal in the library, the Vice-Chancellor's office also has Internet facilities

- in Papua New Guinea, one institution gives 50 percent of its academics access to the Internet (200 terminals in all); two-thirds of 150 terminals used by administrators are hooked up, and just over half the same number of student terminals offer Internet facilities. By contrast, the other provides no Internet access to students, while just over 30 percent of PCs used by administrators and 60 percent of those used by academics can access the Internet

- at the University of the South Pacific, all 200 terminals used by academics and 50 percent of the 400 used by administrators have Internet access, but this applies to only 20 of the 3000 student terminals (less than one percent)

- the three Sri Lankan institutions vary in their approach. At the University of Colombo, Internet access is available on 40 percent of 250 student terminals, a benefit shared by 17 percent of academics and only 8 percent of administrative staff. By contrast, at the University of Kelaniya, only 4 percent of 150 student terminals are connected to the Internet, 4 terminals (20 percent) of terminals used by administrators have access and one-third of academics' PCs can be used to connect to the Internet. The University of Moratuwa gives nearly all its academic staff access (87 percent of 115 terminals), just under 30 percent of administrators' PCs are connected to the Internet, while 70 percent of 200 student terminals provide Internet access

- at Uganda Martyrs University, both terminals used by academic staff have Internet access, but neither administrators nor students have this facility

- at the University of the West Indies, Internet access is provided to 90 percent of the 940 staff PCs; 83 percent of student terminals are likewise hooked up

- Internet access at Copperbelt University in Zambia is currently limited to 5 percent of terminals used by academics, 8 percent of administrators' PCs and only 3 percent of student terminals.

3.7 Who are the Internet and E-mail Users?

The next set of questions aimed to define more closely exactly which levels and categories of staff and students were able to enjoy the use of Internet and e-mail facilities.

3.7.1 *Administrative Staff*

Table G shows to what extent Internet access is made available to seven categories of senior staff within the university administration. Under the 'other' category, institutions named functional areas such as Catering and Accommodation and Planning and Development.

Table G

Country	No. of Responses from Institutions with Internet Access	VC	Registrar	Pro-VCs	Deans	Library	IT Centre	Finance Office	Other
Bangladesh	3	2	2	2	-	1	2	1	-
Botswana	1	1	1	1	1	1	1	1	1
Cameroon	1	1	1	1	1	-	1	1	1
Ghana	1	1	-	-	1	1	1	-	-
India (a)	38	22	18	9	16	27	25	14	16
Jamaica	1	1	1	1	-	1	1	1	-
Kenya	2	2	1	2	1	2	2	1	1
Lesotho	1	1	1	1	1	1	-	1	-
Mauritius	1	1	1	1	1	1	1	1	-
Mozamb-ique	1	1	1	1	1	-	1	1	-
Nigeria (b)	0								
Pakistan	10	8	5	3	6	8	6	5	5
Papua New Guinea	2	2	2	2	2	2	2	2	1
South Pacific	1	1	1	1	1	1	1	1	1
Sri Lanka	3	2	1	-	2	3	3	1	2
Uganda	1	1	-	1	-	-	1	-	-
West Indies	1	1	1	1	1	1	1	1	1
Zambia	1	-	1	-	1	1	1	-	-
Total	**69**	**48**	**38**	**27**	**36**	**51**	**50**	**32**	**29**

a) Two Indian institutions did not reply to this question

b) The one Nigerian institution with Internet access did not make it clear how many terminals were set up with this facility

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In summary, it is not surprising to see that overall the administrative areas with the highest percentage of Internet access are the Library (69 percent of responses) and the IT Centre (68 percent), though it might be expected that the latter area would have had a higher score. In 65 percent of cases, the Vice-Chancellor's office has access to Internet services; just over half the respondents with Internet access (51 percent), extended it to the Registrar's Office. The next highest percentages are for Deans of Faculties (49) and the Finance Office (43 percent). Pro-Vice-Chancellors are less well-served, with Internet access in only 36 percent of cases.

It should, however, be borne in mind, that in 21 of the 72 institutions with Internet access (32 percent; see Section 3.6 above) "Internet access" means facilities provided for the whole university community via a limited number of terminals (1-5 in most cases).

3.7.2 *Academic Staff*

In respect of academic access to Internet services, the questionnaire asked institutions to say:

- what percentage of departments had access
- whether access was limited to departments within certain disciplines
- who in the department could use Internet services, of:
  - head of department
  - senior staff
  - all staff
  - students

and whether this access was via personal PCs or via a shared terminal.

The results were as follows:

- of three institutions in Bangladesh, one gives no access to academic staff, in the second, senior academic staff have access, but via one terminal only; at the third, all academic staff can use the two terminals with Internet access
- at the University of Botswana, 32 of 35 departments (91 percent) have access; heads of department and senior staff have their own terminals; all other staff and most students share common facilities in the computer laboratories

- at the University of Yaounde I in Cameroon, all staff and research students can use the Internet either via common terminals in the computing centre or via one of the 20 (out of 45) departments with access

- at the University of Cape Coast in Ghana, no academic departments have access at present

- of 40 institutions in India with Internet access:

    - 15 (38 percent) said that access to the Internet for academic departments was via terminal(s) at one common location, which was specified as the library in three cases, the IT Centre in two; in one institution, the common terminal was situated in the School of Biotechnology. Three departments in one of these universities also had their own Internet connections. Roorkee University currently offers access from the central Information Superhighway Centre, but plans, within the next few months, to link all academic departments and central facilities via an ATM-based optical backbone which would give all users desktop access. In one institution, access to the common terminal was restricted to academic staff

    - 11 institutions (25 percent) said that all academic departments had Internet access; not surprisingly, these included three institutions with a science/technology focus. In three cases, it was explained that all/most heads of department and senior staff had access via their own PCs, while other staff and students shared common terminals. One said that while there was no policy of restriction for staff and students, Internet access was "need-based"

    - in four institutions, 70-90 percent of departments have Internet access, open to all staff and students

    - at another three institutions half of all departments have access to the Internet; one added that all departments would have this facility eventually. One stipulated that most heads of department had access via their own PCs, while other staff and students used common terminals

    - in one institution, only 4 out of 36 academic departments (11 percent) has Internet access; the subject disciplines involved are physics, applied botany, psychology and mathematics, with access open to staff, researchers and postgraduate students. In two others, staff and students in just under 10 percent of departments have Internet access

    - in two cases, access to the Internet is restricted to one department (Zoology and Pharmacology respectively); in the first case, access is

currently restricted to staff, but will be extended to students shortly

- academic departments in one institution do not have Internet access at all

- one institution did not answer this question

- at the University of Technology of Jamaica, four of seven departments (57 percent) have Internet access; all heads of department and senior have access via their own PCs; other staff and students share common terminals

- in Kenya, one of the two respondents with Internet access offers these facilities to all academic departments via terminals in the Computer Centre, "because dial-up access is expensive". In the other institution, only five departments (in the area of physical and biological sciences) have Internet access, and this is restricted to heads of department and senior staff via shared terminals

- at the National University of Lesotho, staff and students in all academic departments have Internet access, either via individual PCs or common terminals

- at the University of Mauritius, where all five faculties have access to the Internet, all academic staff enjoy access via their own PCs, while students have access via common terminals

- at the University of Eduardo Mondlane in Mozambique, all academic staff and students have access to the Internet, but via a smallish number of shared terminals

- at the University of Agriculture, Abeokuta in Nigeria, Internet access is open to everyone, but in practice about 90 percent of use is by academic staff

- of the 10 respondents in Pakistan

  - in three institutions, all Internet access for staff and students is via common terminals; in a fourth case, only five of 22 departments (23 percent) have their own access, but all staff and students "are encouraged to access the Internet via common terminals in the Computing Centre"

  - there are four institutions where all academic departments have Internet access. In one, heads of departments have access via their own PCs, other staff use shared terminals within the department, students share terminals in the laboratories, in another case, all academic staff have access via individual terminals, but students use shared terminals, the others both allow staff and students to access Internet facilities via their own PCs

- in one institution, Internet access is much more restricted, with only two out of 45 departments having access for staff and students

- at one institution, academic staff have no Internet access

- of the two respondents from Papua New Guinea, one has Internet access in all 13 departments: most heads of department and senior staff have access via individual PCs, while other staff use shared terminals. In the other university, nearly 60 percent of the 32 departments have direct Internet access; the explanation was added that all staff with suitable PCs in buildings connected to the campus network could access the Internet and that some students in networked classrooms also had access to these facilities

- at the University of the South Pacific, all academic departments have Internet access for staff via individual PCs, but students have restricted access, sharing the general facilities, due to the University's low bandwidth

- in Sri Lanka, only one of three respondents has Internet access within all academic departments, the level of access for staff and students depends on individual departments. In the second institution, eight out of 33 departments (24 percent) have Internet access, but use is restricted to heads of department and senior staff. In the third, 17 percent of departments (4 out of 24) have direct access currently; all other staff can access the Internet via common terminals in the computer centre

- at Uganda Martyrs University, all three academic departments have Internet facilities, but use is restricted to staff only

- at the University of the West Indies, there is Internet access within all 75 departments, via individual terminals for heads of department and senior staff; students have limited access

- at Copperbelt University in Zambia, staff and students in two-thirds of the six departments can access the Internet, but only via a very limited number of common terminals

3.8 Access within Institutions to E-mail

Institutions were asked to supply the same information in relation to e-mail facilities, namely the percentage of terminals with access to this service and details of whom, among staff and students, had access to these facilities. Of the 102 institutions

involved, 53 get e-mail services via their ISP and the details of access were the same as for Internet services; 30 have e-mail only; 19 have Internet facilities, but details of e-mail access differ from those applying to Internet use.

In summary, the results are as follows:

- in Bangladesh, with 7 institutions with e-mail, two universities have only one terminal providing e-mail services to all users; another has one e-mail terminal each for academic and administrative staff, but no student provision; at a third, only five percent of terminals used by academics can access e-mail, with provision for administrators and students still more limited; at Bangladesh Open University, around a third of terminals used by academic and administrative staff provide e-mail services; North South University is the best equipped, with all staff terminals (70 in total) and almost 30 percent of student PCs with e-mail provision; no details were given by the other institution

- Botswana, Cameroon: e-mail access is the same as for Internet access, (see Section 3.6 above)

- in Ghana, two out of four institutions provide e-mail facilities only to administrative staff (5 and 12.5 percent of terminals respectively); the third has e-mail access via terminals in the library, the Vice-Chancellor's office and the computer centre; academic staff and students share the latter facility. The University of Science & Technology, Kumasi, has e-mail provision only for 10 percent of the 100 PCs used by academics, while access for students and administrative staff drops to two percent of the 150+ terminals used by both groups

- of 52 Indian universities with e-mail access:

  a) at 10 institutions, e-mail access is restricted to one terminal in the library; at nine of these universities, the whole university community could use this facility; in one, access was restricted to staff

  b) in a further eight cases, there are a number of terminals in the library which provide e-mail access to staff and students

  c) in another four institutions, there are between 10 and 30 terminals which provide e-mail access for all staff and students

  d) two institutions offer staff access to e-mail via the small number of terminals available for their use (two and four respectively); there is no student provision

e) the best provision is at IIT Kanpur and Punjabi University, each with e-mail services available from all terminals used by staff and students (1000 and 450 in total, respectively), on a smaller scale, Dr Y S Parmar University of Horticulture & Forestry has e-mail available for staff and students at all its 35 terminals. Terminals for staff at Govind Ballabh Pant UAT have 100 percent e-mail access (54 in all), but only one third of 15 student terminals have this facility. Jawaharlal Nehru University provides e-mail to two-thirds of its 420 staff and student terminals

f) in the next rank, five institutions provide e-mail access via 40-60 percent of terminals used by academic staff, not surprisingly, two of these are science/technology and medical institutions. E-mail access for administrative staff in these universities is provided for 57, 50, 33, 5 and zero percent of terminals, respectively. Student access ranges from 57 to 10 percent of terminals

g) a further five institutions have e-mail facilities accessible from 20-30 percent of terminals used by academic staff, in two of these institutions, however, there is no e-mail access at terminals used by administrative staff, at the other three, 30-40 percent of administrative staff terminals have e-mail provision, the percentage of student terminals with e-mail in this group is zero (an Open University), 7, 11, 25, and 80 percent respectively

h) one institution provides e-mail facilities at 14 percent of academics' PC's, there is no provision via terminals for administrative staff and only 7 percent of student PC's have e-mail provision

i) for academics at five institutions, e-mail facilities are only available at between 2 and 7 percent of their terminals, in four of these cases, provision for administrative staff and students is in a similar range, but one university provides e-mail to 5 of its 10 PC's for administrators and to all 40 student terminals

j) terminals used by academics at three institutions have no e-mail provision, in two of these cases, student PC's also lack this facility, while the third has e-mail access at 7 of its 10 student terminals. E-mail services for administrative staff are available at 7, 30, and 71 percent of terminals respectively

k) two institutions with e-mail did not answer this question

- Jamaica e-mail access is the same as Internet access (see Section 3.6 above)

- of the 4 Kenyan respondents with e-mail access, academics and administrators

at Maseno University College have e-mail provision at all terminals, but there are only five involved; there is no student provision. At Egerton and Moi universities, the percentage of terminals with e-mail access is low: 5 and 3 percent respectively for academics, 5 and 10 percent for administrators, around 2 percent for students. At the University of Nairobi, 10 terminals used by academics have e-mail (percentage of total PCs unknown), almost 40 percent of 130 terminals used by students have e-mail facilities, but there is no provision for administrative staff

- at the National University of Lesotho, 50 percent of the 200 terminals for academic use have e-mail provision, and 80 percent of the 50 terminals used by administrators are similarly equipped; the information on student use could not be read

- at the University of Mauritius, e-mail access is the same as Internet access (see section 3.6 above)

- in Mozambique, the University of Education has e-mail facilities at all staff terminals, but there are only 4 in total; there is no student provision; at Eduardo Mondlane University, e-mail access provision extends to 8 percent of academic PCs and 7 percent of those used by administrative staff and students. The University has 175 terminals in all

- of the five Nigerian respondents with e-mail provision, two rely on one terminal with e-mail access for use by both staff and students. The University of Abuja is the best equipped, with e-mail available at all 85 terminals used by staff and students. At Abubakar Tafawa Balewa University, 3 of the 20 PCs used by academics and one of the 10 used by administrators have e-mail provision, there is no student provision. At the University of Jos, administrators are best served, with 2 out of 20 terminals offering e-mail facilities; less than 4 percent of the 140 PCs used by academics have this facility; there is no student access

- of 10 respondents from Pakistan

  a) five have all staff terminals (numbers range from nine to 200+) with e-mail access (with the exception of secretarial staff in one case); three of these provide access to all students, one to 84 percent of student PCs, and one to 17 percent of student PCs only

  b) in one institution, e-mail facilities are provided via one common terminal for everyone; the same is true for staff and students in a second university, but there are also e-mail services in the Vice-Chancellor's office; in a third, there are 11 terminals with e-mail provision and nine of these are for common use

c) one university has 20 percent of the 75 terminals used by academic and administrative staff with e-mail access, 16 percent of the 225 student terminals have access

d) in another institution, only two percent of 254 terminals for academics have e-mail access, administrators do rather better, with 11 percent of 176 terminals with e-mail provision, 17 percent of 30 student terminals have access

- the University of Papua New Guinea provides e-mail services to approximately 50 percent of the 350 terminals used by academic staff and students, while two-thirds of the 150 terminals used by administrators have access; at PNGUT, almost all the 250 PCs used by academics have e-mail, and about half of the 260 in administrative offices, there is no student provision

- at the University of the South Pacific, e-mail access is the same as Internet access (see section 3.6 above)

- of four institutions in Sri Lanka with e-mail access, the General Sir John Kotelawala Defence Academy has one terminal with e-mail, which is shared by all staff, at the University of Colombo, 17 percent of PCs used by academic staff, 8 percent of those in administrative offices and 40 percent of PCs for student use have e-mail provision (the University has approximately 430 terminals in total). Half the 30 terminals for academic use and a quarter of the 20 used by administrators have e-mail access at the University of Kelaniya, there is no student provision. At the University of Moratuwa, 87 percent of 115 PCs for academic use and 70 percent of 200 student terminals have e-mail, administrative staff fare less well with just under 30 percent of PCs with e-mail provision

- The Open University of Tanzania has one terminal with e-mail, but no information was provided on level or extent of access

- in Uganda, Mbarara UST has one terminal with e-mail access for the entire university, at Uganda Martyrs University, both terminals for academic staff have e-mail facilities, but there is no provision for administrators or students

- at the University of the West Indies, e-mail access is the same as Internet access (see section 3.6 above)

3.9 Who are the E-mail Users?

3.9.1 *Administrative Staff*

Table H shows to what extent Internet access is made available to seven categories of senior staff within the university administration. Under the 'other' category, institutions said, for example, that there were terminals with e-mail access in "all departments" or in "some individual staff offices"

Table H

Country	Number of Institutions with E-mail Access	VC	Registrar	Pro-VCs	Deans	Library	IT Centre	Bursar	Other
Bangladesh	6*	4	3	3	2	3	4	2	2
Botswana	1	1	1	1	1	1	1	1	1
Cameroon	1	1	1	1	1	-	1	1	1
Ghana	4	2	1	-	1	2	2	-	1
India	52	25	22	12	20	31	33	18	20
Jamaica	1	1	1	1	-	1	1	1	-
Kenya	4**	4	2	3	2	2	3	1	2
Lesotho	1	1	1	1	1	1	-	1	-
Mauritius	1	1	1	1	1	1	1	1	-
Mozambique	2	1	1	1	1	-	1	1	-
Nigeria	5	4	2	-	1	1	3	1	3
Pakistan	10	9	6	3	7	8	8	5	5
Papua New Guinea	2	2	2	2	2	2	2	2	1
South Pacific	1	1	1	1	1	1	1	1	1
Sri Lanka	4	2	-	-	2	2	3	-	3
Tanzania	1	-	-	-	-	-	-	-	-
Uganda	2	1	-	1	-	1	1	-	-
West Indies	1	1	1	1	1	1	1	1	1
Zambia	1	-	-	-	1	1	1	-	-
Total	**100**	64	48	32	46	59	67	37	39

* There are 7 institutions with e-mail access, but only 6 gave information sufficient for this table
** There are 5 institutions with e-mail access, but only 4 gave information sufficient for this table

The picture is fairly similar to that for Internet access among administrative staff, though for e-mail provision, the IT Centre (rather than the Library) has the highest level of access (67 percent of responses), and the Vice-Chancellor's Office takes

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second place (61 percent), over the Library (59 percent). The pecking order for the other offices is the same as for access to the Internet. Registrars and Deans have a similar level of access (48 and 46 percent respectively), followed by the Finance Office (37 percent) and Pro-Vice-Chancellors (32 percent).

At the universities of Botswana, Mauritius, South Pacific, the West Indies and both institutions in Papua New Guinea, all seven categories of named administrative staff have access to e-mail.

3.9.2 *Academic Staff*

In respect of academic access to e-mail services, the questionnaire asked institutions to say:

- what percentage of departments had access
- whether access was limited to departments within certain disciplines
- who in the department could use e-mail
    - head of department
    - senior staff
    - all staff
    - students

and whether this access was via personal PC's or via a shared terminal.

The results were as follows:

- in all six institutions in Bangladesh which answered this question, academic access to e-mail is via common terminals, in one instance, e-mail use is restricted to staff and senior students, and in another two to academic staff. In two of these institutions, there is only one terminal available for e-mail use.
- Botswana, Cameroon: e-mail access is the same as Internet access (see section 3.7.2 above).
- in Ghana, where there are four respondents with e-mail, academic access is via common terminals in five out of 40 departments at one institution and in five centres plus one faculty (out of 25 departments) at the second. The third university has no direct e-mail access within departments, staff and students use shared terminals at another location. Academic staff and student have no access to e-mail at the fourth institution.

- within India:

  a) the most common means of e-mail access is via common terminal(s), often located in the Computer Centre or Library: this applies to 21 of the 52 respondents with e-mail provision (40 percent); in two of these cases, access was restricted to staff and in another two to staff and research/postgraduate students only; one institution in this group, however, would have desktop access on completion of an ATM optical backbone link

  b) in nine institutions (four of them science/technology or medicine-focused), all departments have direct email access, in three of these cases, heads of department and senior staff have access via their own terminals, while other staff and students share common terminals, in one instance, there are centrally-located common terminals with e-mail access too

  c) in five institutions, 70-90 percent of departments have e-mail provision for all staff/students)

  d) in another three institutions, 40-50 percent of departments have access to e-mail, in one of these, heads of departments have access via their own terminals, but other staff and students use the IT centre PCs; the other two offer access via shared terminals in the departments, but in one case, to staff only

  e) two more institutions have e-mail provision in 20-30 percent of departments, one has common terminals also

  f) only 10-20 percent of departments have direct e-mail access in another two universities, in one case, access is only for staff, researchers and postgraduate students

  g) one institution offers access only to staff via two centres (the Zoology department and the Library); another has direct e-mail access only in its science/technology departments, but everyone can use the facilities

  h) two universities provide e-mail access only to heads of department and senior staff, in another instance, only the heads of physics and chemistry and the library have e-mail access

  i) two institutions said that all staff and students had access to e-mail, but gave no details

  j) one said that there was no direct access in departments and most staff

and students could not use e-mail

k) one institution reported that departmental e-mail for all staff and students was being installed

l) two universities did not answer this question

- at the University of Technology, Jamaica, details of e-mail access are the same as Internet access (see section 3.7.2 above)

- of the four respondents with e-mail provision in Kenya, three offer e-mail access to staff and students via common terminals in the Computer Centre or elsewhere. Two of these institutions cited, respectively, the expense of dial-up access and slow telephone line speeds (at 2400Bps) as the reason for this practice. In the fourth case, access is restricted to heads of department and senior staff in five science departments

- at the National University of Lesotho, academic staff and students in all departments can access e-mail services either via individual or shared terminals

- at the University of Mauritius, details of e-mail access are the same as Internet access (see section 3.7.2 above)

- in Mozambique, all staff and students at Eduardo Mondlane University have access to e-mail services; the University of Education does not give students e-mail access

- among our Nigerian respondents, the best provision is at the University of Abuja where all 25 departments have e-mail facilities, to be used by staff and computer science students; staff and students at three institutions gain access to e-mail only via common terminals (in the case of the large multi-campus University of Nigeria, there is only one e-mail terminal for the whole institution); the remaining institution said only that about 90 percent of e-mail use was by academic staff

- in Pakistan

  a) four institutions provide e-mail access to academic staff and students via common terminal(s)

  b) e-mail provision is good in four institutions, where all departments have direct access. In two cases, staff and students have access via individual terminals; in the third, individual access is reserved for heads of department, and in the fourth for academic staff, while other users resort to shared terminals

c) one engineering-focused university has e-mail access in four of its eight departments, for use by staff and students

d) only five out of 22 departments at the last university have direct access for staff and students, but all departments are encouraged to use common terminals in the IT centre

- at Papua New Guinea University of Technology, there is e-mail access in all 13 departments: most department heads and senior staff have access via their own terminals, while other staff share common terminals; there is no student access to e-mail. At the University of Papua New Guinea, all staff with suitable PCs in networked buildings (almost 60 percent of 32 departments) and some students in networked classrooms have e-mail access

- at the University of the South Pacific, details of e-mail access are as for Internet access (see section 3.7.2 above)

- in Sri Lanka, there is e-mail access in all 13 departments at the University of Moratuwa, but staff/student access depends on individual departments; just under a quarter of departments at Colombo University have e-mail access, which is restricted to heads of department and senior staff; at Kelaniya, 16 percent of 24 academic departments have direct e-mail access (other staff use common terminals at the IT centre); academic e-mail access at General Sir John Lotelawala Defence Academy is restricted to staff

- at Mbarara UST in Uganda, e-mail services are available for staff and students at one terminal only in the Library (use for non-work purposes is discouraged but is possible on payment of a fee); at Uganda Martyrs University, all three departments have e-mail access for staff use only

- at the University of the West Indies, details of e-mail access are as for Internet access (see section 3.7.2 above)

- at Copperbelt University in Zambia, staff and students can access e-mail services via shared terminals in four centres (library, computer centre and two schools)

3.10 Problems/Realities of Access

Behind the bald statistics relating to Internet and e-mail usage within the institutions which responded to the survey, some comments on the questionnaires or accompanying letters give some insight into the quality of experience for users of these facilities, particularly in the substantial number of institutions where access is

restricted to one or a few common terminal(s) for the whole university community.

At the University of Papua New Guinea, Internet access is possible both for staff in buildings connected to the campus network and to those in non-networked departments via dial-up access using a modem, but the comment was made that "some departments do not provide their staff with suitable PCs." At the University of the South Pacific, almost all staff have Internet access, including those on the University's outlying campuses, but access for students (who share the general facilities) is limited "because of our low bandwidth".

A brief reply from Scott Theological College in Kenya informed CHEMS that "we have e-mail service which is unfortunately hooked in someone's computer in his house. Earlier, we tried to have such [a] facility in our office but due to the nature and location of our old office, it was found to be inadequate". Similarly, at Buddhist and Pali University in Sri Lanka, Internet and e-mail access is currently only available via the Librarian who has facilities at home, but plans to install these facilities, firstly in the main Library and then in the Vice-Chancellors' Office, starting in July 1998, were mentioned.

Where e-mail access is limited to one terminal within the institution, the business of sending and receiving mail may be a somewhat cumbersome and less speedy process than users in developed countries might expect. At the University of Agriculture, Abeokuta in Nigeria, where there is only one terminal with e-mail access, "members of the university community are expected to type their message on diskette and give them to the system administrator who then sends the messages. Incoming mails are also copied on diskette and printed. The mails are then sent to the final recipients". Uganda Martyrs University has two terminals with e-mail/Web access, but comment was made that "the access modem is very slow and the server very busy. It is therefore difficult to download material from the Internet." A certain degree of frustration may be inferred from the reply at Copperbelt University in Zambia, where currently only a fraction of terminals can access the Internet: "here we need a full Internet access, not a limited one like we have now"; expansion was planned, but no timescale was given.

Financial constraints on widespread use are also evident. At Egerton University in Kenya, all staff and students in academic departments have access to the one terminal with e-mail facility located in the Computer Centre, but "we charge a small fee to cover costs". At Mbarara University of Science and Technology in Uganda, all staff and students may access, in an "official capacity" the one terminal in the Library which offers e-mail facility, while "private e-mail usage" is discouraged, individuals who wish to send personal messages are charged a fee.

In countries where the political regime is unstable, external events may also have a disastrous effect on the continuing availability of Internet and e-mail services. Karen Banks at GreenNet reported in 1997 that recent political events in Sierra Leone had

rendered the University's system "completely inoperable", because the systems operators had fled to nearby countries.

3.11 The Network Connection

It would seem logical that wide-ranging access to Internet and e-mail facilities would be linked to the possession within institutions of computing network(s) linking all terminals on the campus or campuses. Institution were, therefore, asked to say whether they had a network on their campus(es) and, if there was more than one campus, whether the networks were linked.

Positive responses were given by the following institutions, as shown in Table I below: the last column of this table indicates whether the institution has a relatively high level of access to Internet and/or e-mail services, based on responses to previous questions in the survey.

Table I

Country	Institution	Network on Main/Sole Campus?	More than One Campus?	Campus Networks Linked?	Relatively High Level of Internet and/or E-mail Access?
Bangladesh	North South	Yes	Yes	Yes	Yes
Bangladesh	Open	Yes	Yes	Yes	
Botswana	U. of Botswana	Yes	Yes	Yes (LAN)	Yes
Cameroon	Yaounde I	Yes	Yes	Yes	Yes
Ghana	UST Kumasi	Yes	Yes	No	
India	All-India IMS	Yes	N/A	N/A	Yes
India	B aras Hindu	Yes	N/A	N/A	
India	Bengal Engin-eering C	Yes	N/A	N/A	
India	Central I Fisheries Education	Yes	N/A	N/A	
India	Govind Ballabh Pant UAT	Yes	N/A	N/A	Yes

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India	Gujarat Agric-ultural	Yes	Yes	No	
India	Hyderabad	Yes	N/A	N/A	Yes
India	I.I. Science, Bangalore	Yes	N/A	N/A	
India	IIT Bombay	Yes	N/A	N/A	Yes
India	IIT Kanpur	Yes	N/A	N/A	Yes
India	IGNOU	Yes	Yes	No	
India	Jawaharlal Nehru	Yes	N/A	N/A	Yes
India	Kerala	Yes	Yes	Yes	
India	Kota Open	Yes	N/A	N/A	
India	Punjab Agricult-ural	Yes	N/A	N/A	
India	Punjabi	Yes	N/A	N/A	Yes
India	Rajasthan Agric-ultural	Yes	N/A	N/A	
India	SNDT Women's	Yes	Yes	No	
India	Sree Chitra Tirunal IMS	Yes	Yes	No	
India	Tezpur	Yes	Yes (temp-orary)	No	
Mauritius	U. of Mauritius	Yes	N/A	N/A	Yes
Mozamb-ique	Eduardo Mondlane	Yes	Yes	Partially linked	
Nigeria	Abuja	Yes	N/A	N/A	Yes
Pakistan	Ghulam Ishaq Khan IEST	Yes	N/A	N/A	Yes
Pakistan	Lahore UMS	Yes	N/A	N/A	Yes
Pakistan	SZABIST	Yes	Yes	No	Yes
Pakistan	Sir Syed	Yes	N/A	N/A	Yes

Papua New Guinea	PNGUT	Yes	N/A	N/A	Yes
South Pacific	U. of South Pacific	Yes	Yes	Yes	Yes
Sri Lanka	Moratuwa	Yes	N/A	N/A	Yes
West Indies	U. of West Indies	Yes	Yes	Planned	Yes

The results in Table I suggest that a correlation between having one or more campuses networked and achieving a relatively high level of access to e-mail and/or Internet facilities (e.g. 50-100% of staff terminals provided with these facilities) is fairly strong, but not invariable. It holds good for the universities of Botswana, Mauritius, South Pacific and the West Indies, for Yaounde I in Cameroon, Abuja in Nigeria, Moratuwa in Sri Lanka, Papua New Guinea University of Technology and one of the two Bangladeshi institutions which are networked. All the Pakistan institutions which have networks are delivering wide access to Internet and e-mail. The picture is patchier in India: of 20 networked institutions, only seven seem to be utilising that capacity to provide extensive access to e-mail and Internet services. There are also a handful of institutions (the National University of Lesotho, NED UET in Pakistan, the University of Papua New Guinea) which are managing to provide a good level of access to Internet and/or e-mail without a networked system across the whole campus.

Given the fact that in the majority of cases, possession of campus network(s) does seem to ensure a relatively high level of access to Internet and/or e-mail facilities, it is encouraging to note that computing networks are also planned or under construction at a further eight Indian institutions, one of these plans for all its separate campuses to be linked, and another to have networks at each campus, but not linked. At Moi University in Kenya, a network is under development, the University of Jos in Nigeria has plans for a network, as does NED UET in Pakistan. At the University of Papua New Guinea, networks on the main and other campuses are being built and all will be linked; similar work is under way at the University of Colombo in Sri Lanka. At Uganda Martyrs University and Copperbelt University in Zambia, there are plans to install a network.

3.12 Plans for/Constraints on Future Expansion

It has been seen that almost every institution responding to the survey which currently lacks either an Internet connection and/or e-mail services, expressed the intention of remedying this lack within the near future.

In some cases, however, constraints on higher education access to Web and e-mail access are linked to the national infrastructure: the University of Abuja in Nigeria said that it planned to have Internet access "as soon as Nigeria gets its gateway". A major

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obstacle to rapid expansion of Internet provision in Africa is the poor condition of the telecommunications networks: only 13 African countries have more than one phone per hundred people, whereas the US ratio is fifty phones to every hundred.[8]

For other institutions, what is halting growth in this area is lack of money. Both the University of Jos and Abubakar Tafawa Balewa University in Nigeria said that their plans for getting Internet access were linked to the availability of funding for this purpose. The University of Nigeria said they would get access to Internet facilities "when the finances of the university improve". Similarly, the Open University of Tanzania currently has e-mail services via two terminals, the speed with which plans to extend facilities to include Internet access would be implemented "is determined by availability of finances to complete the exercise". In Uganda, Mbarara University of Science and Technology "would wish to have [Internet access] as soon as possible, but financial problems are a big hindrance to acquiring the software, technical services and the training of staff in its usage"

There is, however, evidence that interest in promoting expanded access to Internet and email within the higher education systems in lower income countries is considerable

Initiatives stem both from HEIs themselves, and from external agencies. In India, *University News* reported that the Indira Gandhi National Open University (IGNOU) had scheduled an international conference for February 1998 focused on "technologies for networking and collaborative learning" including the "sharing of organisational resources from bricks and mortar to wires and webs".[9] In 1997, the Indian Institute of Technology, Delhi launched a short course (free of charge) on the use of audio-visual aids in teaching via the Internet.[10] Early in 1998, the Indian Institute of Management, Lucknow ran a course aimed at senior level Librarians which included sessions on Telecommunications, Networking and Internet, and Virtual Libraries.[11] A bullish article on technology management education in India claims that "the problems encountered in effective sharing of resources can be addressed by a computer based implementation" citing the provision of connectivity already in place via ERNET and VSNL. The author does, however, admit the considerable disparity that exists within the Indian HE system as regards technological progress, with "many institutes where the teaching is limited to chalk and blackboard" alongside those with "LAN, WAN, world-wide web and multimedia systems".[12]

Apart from the AAU activities already mentioned (see Section 3.1 above), initiatives focused on Africa have included, in May 1998, a workshop on Internet connectivity hosted by H-Net and the African Studies Center at Michigan State University: its goal was to "facilitate the use of the Internet by African scholars ..." and to "provide intensive training and support for key personnel at various African universities who will then serve as trainers for faculty, graduate students and staff at their home institutions".[13] In the US, the Electronic Technology Group of the African Studies

Association publishes *The Electronic Newsletter of African Studies* on the Web.[14] In 1997, the World Bank in Washington, DC launched its African Virtual University (AVU) project, which uses satellite- and computer-based technology "to increase access to desperately needed educational resources" in Sub-Saharan Africa. The AVU's focus is on offering degree programmes in science, technology, and medical fields, as existing programmes in these fields are felt to be "inadequate to meet the rapidly increasing demands of students" and attempts by African governments to finance alternative programmes and to expand traditional higher education institutions have fallen short.[15] Universities in Ghana and Kenya have been working on AVU courses in the current year.

In Europe, the International Association of Universities (IAU) set up a Task Force on Universities and Information Technologies in 1996, with the AAU Secretary General as one of its Permanent Members.[16] As long ago as 1985, UNESCO was pioneering the use of e-mail to "stimulate dialogue between researchers, academics and industrialists throughout the continent" via the RINAF (Regional Informatics Network for Africa) Initiative.[17]

Outside the HE sector, UNESCO and DANIDA are giving their support to pilot projects in five African countries to set up Rural Multipurpose Community Telecentres, which will "offer a low-cost means of providing library services through the provision of access to national and world-wide electronic information". The first two projects are sited in Uganda and Mali, with other to follow in Benin, Mozambique and Tanzania.[18] In the UK, the Internet Access Group on Africa ran a seminar in March 1998 on Unleashing the Potential of the Internet in Africa, and has just published its first newsletter,[19] while the British Computer Society has a Developing Countries Specialist Group, with its own e-mail discussion list.[20]

A recent report from the UN Commission on Science and Technology which examines "the impact of new technologies on market opportunities, employment, lifelong learning, styles of working and the role of women" and aims to provide "practical guidelines for government and business leaders on the creation of national IT strategies" has found that "knowledge from new information and communications technologies can be converted into real social and economic benefit" within developing countries. It does, however, also warn that new products and applications are frequently designed "in ignorance of developing countries' realities" and fail to address the needs of the most disadvantaged sections of the community.[21] Similarly, a recent report from the Panos Institute admits that "the Internet has a great deal to offer in tackling poverty", but raises two concerns: that donors may be investing too much in promoting this technology at the expense of more traditional (and more greatly needed) forms of development assistance, and that insufficient attention is being paid to a "growing information poverty gap between those who have access to this technology and those who do not".[22]

4. Conclusions

Responses to the CHEMS survey and information from other sources suggest a considerable degree of interest among universities in developing countries in gaining access to Internet and e-mail facilities. Across the countries surveyed, Internet access has already been achieved in at least a quarter of accredited university-level institutions[21], while e-mail access has reached a minimum of 45 percent of HE institutions.

Generally, Internet access is more widespread in Asia, the Caribbean and the Asia-Pacific region than in Africa; universities in Pakistan, in particular, seem to have made great strides over the last three years in acquiring Internet facilities and ensuring extensive provision for their users. Within Africa, survey respondents in Botswana, Cameroon, Mauritius, Lesotho and Mozambique enjoy better connectivity and can provide access to Internet ands e-mail on a wider scale than their counterparts in Ghana, Kenya and Nigeria, where a full Web connection is rare. Other information sources suggest that good connectivity has also been achieved at the University of Zambia.

Though some science and technology-focused providers forged ahead, getting access to these technologies as early as 1987, the majority of HEIs surveyed achieved connectivity within the last three years. Within most countries, institutions are using a wide variety of ISPs and/or e-mail service providers, though in India the field is dominated by three organisations (VSNL, NIC and ERNET). Those institutions which lack either one or both technologies are keen to acquire them, though a lack of funds is the major obstacle to realising this ambition.

From the user's standpoint, however, having "access to Internet and e-mail" within most of the universities surveyed is a very different experience from that of academics and students in developed countries. Half of our respondents in India and Pakistan and most of those in Africa rely on analogue dial-up access via a modem to access the Internet, a slow and expensive option. While there are around 25 institutions able to provide desktop access to Internet and/or e-mail for 50 percent of their academic staff (or more), almost half the institutions surveyed rely on common terminals (in some cases, only one) to provide Internet and e-mail for the whole university community. Plans to construct campus-wide computing networks, adduced by 13 percent of respondents, are, however, likely to improve this situation within the next few years. Outside individual HEIs, the challenge to improve access to these technologies within developing countries, both within and outside the HE sector, is one that has been taken up by a multiplicity of agencies, but the effort required, to help institutions find the necessary funds and to overcome problems posed by poor telecommunications systems, political instability and other defects inherent in the national infrastructure is likely to be considerable.

Notes/References

[1] The Los Alamos archive can be accessed at http://xxx.lanl.gov/

[2] For further discussion of this issue, see Fielden, J., 1998, *The Multinational Electronic University - and its Relationship with Governments* (CHEMS Paper No 19A), CHEMS, London

[3] The site can be accessed at http://www.mit.edu/people/cdemello/univ.html

[4] The URL is http://www.yahoo.com/Education/Higher_Education/Colleges_and_Universities/

[5] In the words of Mike Brodbelt, IT Manager at the Association of Commonwealth Universities

[6] The site can be accessed at http://www.bangla.org/bdinct/

[7] A count on student numbers, using information supplied to the ACU by approximately 75 percent of these institutions produced a total of 517,701.

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[12] *University News*, 36(7), February 16 1998

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[14] The Newsletter can be accessed at http://www.sas.upenn.edu/African_Studies/ASA/etg_news2.html

[15] Further information on AVU can be found at http://www.avu.org/english/about/fcas.htm

[16] More information is available at http://www.unesco.org/iss/tf1stpage.html

[17] 'E-mail for research networking in Africa', MMSZ News, No. 31, August 1997

[18] 'Telematics Unit: African Public Libraries as Gateways to Information Highways', *Information Informatics Telematics* (UNISIST Newsletter) Vol. 25 No2, 1997, UNESCO Information and Informatics Division, Paris, pp 12-13

[19] For further information, contact Mike Chivhanga, Infoaction Design Centre, St Matthias Old Church, Poplar High Street, Docklands, London E14 0AE. Tel: +44 171 515 1428. Fax: +44 171 531 9973. E-mail: bmmc@dircon.co.uk URL: http://www.bmmc.dircon.co.uk

[20] This Mailbase list can be accessed at http://www.mailbase.ac.uk/lists/hcs-devel

[21] 'Net could close gap between rich and poor', University of Sussex *Bulletin*, May 1st 1998, reporting on the publication of Mansell, R. and When, U. (eds), *Knowledge Societies*, 1998, UN Commission on Science and Technology

[22] Deane, J., *Internet and Poverty: Real Help or Real Hype?*, 1998, Panos Institute, London

[23] i.e. those eligible for membership of their national inter-university body and for inclusion in the ACU's *Commonwealth Universities Yearbook*

APPENDIX 1

QUESTIONNAIRE

CHEMS Survey of Access to Internet and E-mail Facilities within Universities in Developing Commonwealth Countries

Name of Institution:

1) Is your institution connected to the Internet? **YES** **NO**

If you answered YES to Question 1, please answer questions 2-5 below.
If NO, please go on to Question 6

2) **Internet Service Details**

a) What is the name of your service provider?

b) What is your Web Site URL?

c) In which year did your institution get an Internet connection?

d) What mode of access to the Internet do you have?

i) Dial up access using a modem and an analogue phone line (speed limited to 33.6 Kbps)?
ii) Dial up access using a digital phone line (eg ISDN, ADSL) (speed of 64-128 Kbps)
iii) Leased line (permanently connected digital carrier circuit with speed from 64 Kbps to 2MBps)

3) **Level of Internet Use in the Institution:**

a) What is the total (approximate) number of terminals in your institution?

For academic staff

For administrative staff

For students

b) How many of these terminals can access the Internet?

For academic staff

For administrative staff

For students

4) **Who are the Internet Users in the Institution? (managerial/administrative staff)**

In which administrative offices of the institution are terminals with Internet access situated?

- Vice-Chancellor's Office
  Yes
  No
- Registrar's Office
  Yes
  No
- Offices of Pro-Vice-Chancellors/Vice-Principals, etc
  Yes
  No
- Offices of Deans of Faculties
  Yes
  No
- Library
  Yes
  No
- Computing Centre
  Yes
  No
- Finance Office
  Yes
  No
- Other (if yes, please specify)
  Yes
  No

5) **Who are the Internet Users? (academic staff/students)**

a) How many academic departments are there in the institution?

b) How many of them have Internet access?

c) Is Internet access currently restricted to departments in certain disciplines? If so, please specify which.

d) Who has access to the Internet within each academic department? Please specify whether staff have access via their own terminals, or via a common terminal.

Head of Department?

Senior staff only?

All staff?

All staff and students?

If your institution does not have a full Web connection, but has e-mail access, please answer Questions 6-9.

If your institution does not have e-mail access, please go on to Question 11.

6) **E-mail Service Details**

a) What is the name of your service provider for e-mail?

b) In which year did your institution get e-mail facilities?

c) Do you have a general mailbox e-mail address for the whole institution? If so, please give the e-mail address

d) What is the e-mail address for the Principal or Vice-Chancellor

7) **Level of e-mail Access in the Institution:**

a) What is the total (approximate) number of terminals in your institution?

For academic staff

For administrative staff

For students

b) How many of these terminals have e-mail facilities?

For academic staff

For administrative staff

For students

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8) **Who are the E-mail Users (*managerial/administrative staff*)**

a) In which administrative offices of the institution are terminals with e-mail access situated?

- Vice-Chancellor's Office — Yes / No
- Registrar's Office — Yes / No
- Offices of Pro-Vice-Chancellors/Vice-Principals, etc — Yes / No
- Offices of Deans of Faculties — Yes / No
- Library — Yes / No
- Computing Centre — Yes / No
- Finance Office — Yes / No
- Other (please specify) — Yes / No

9) **Who are the E-mail Users? (*academic staff/students*)**

a) How many academic departments are there in the institution?

b) How many of them have e-mail access?

c) Is e-mail access currently restricted to departments in certain disciplines? If so, please specify which

d) Who has access to e-mail facilities within each academic department? Please specify whether staff have access via their own terminals, or via a common terminal within the department

Head of Department?

Senior staff only?

All staff?

All staff and students?

10) Campus Networks

a) Is there a computing network across the whole campus?

b) If your university has more than one campus, does each campus have its own network?

c) Are all campus networks linked?

11) If you do not have Internet access yet, are you planning to do so? YES NO

If the answer was Yes, please say when you hope to have Internet facilities and what proportion of terminals in the institution will have access.

12) If you do not have e-mail access yet, are you planning to do so? YES NO

If the answer was Yes, please say when you hope to have e-mail facilities and what proportion of terminals in the institution will have access?

PLEASE ANSWER AS MANY QUESTIONS AS ARE RELEVANT TO YOUR INSTITUTION AND RETURN THIS FORM DIRECT TO

Dr Helen Lund, CHEMS, 36 Gordon Square, London, England, WC1H 0PF
or by Fax to +44 171 387 2655 or by email to h.lund@acu.ac.uk

Please return your questionnaire to reach CHEMS by 8 June 1998

Thank you for your help.

APPENDIX II

WWW URLS

Bangladesh

1. Bangladesh University of Engineering & Technology: http://www.tuns.ca/~abidmr/buet.html (described as 'unofficial' WWW site)
2. Bangladesh Open University: http://www.grameen-cyber.net/bou
3. University of Chittagong: http://www.spctnet.com/cu.html
4. International University of Business Agriculture & Technology: http://www.bangla.net/iubat
5. North South University: http://www.northsouth.edu

Cameroon

1. University of Yaounde I: http://uycdc.uninet.cm (click on universités and then université de Yaounde I)

Ghana

1. University of Cape Coast: http://www.ghana.com.gh/UCC
2. University of Ghana: http://www.ug.edu.gh/

India

1. All India Institute of Medical Sciences: http://www.aiims.ac.in
2. Anna University: http://www.annauniv.org
3. Bharathiar University: http://www.bharathi.ernet.in
4. Bharati Vidyapeeeth: http://www.geocities.com/capecanaveral/4575/bharati.htm
5. Cochin University of Science & Technology: http://cusat.edu/home.htm
6. University of Delhi: http://www.du.ac.in
7. Goa University: http://www.unigoa.ernet.in
8. Govind Ballabh Pant University of Agriculture and Technology: http://www.gbpuat.ernet.in (under construction)
9. Gujarat Agricultural University: http://www.angelfire.com/ga/gauguj
10. University of Hyderabad: http://www.uohyd.ernet.in
11. Indian Institute of Population Studies: http://www.ncst.ernet.in/other/iips
12. Indian Institute of Science: http://www.iisc.ernet.in
13. Indian Institute of Science, Bangalore: http://www.iisc.ernet.in
14. Indian Institute of Technology, Bombay: http://www.iitb.ernet.in
15. Indian Institute of Technology, Kanpur: http://www.iitk.ernet.in/
16. Indian Institute of Technology, Madras: http://www.iitm.ernet.in/
17. Indira Gandhi National Open University: http://www.ignou.edu
18. Jawaharlal Nehru University: http://www.jnu.ac.in
19. Kurukshetra University: http://kuk.ernet.in
20. University of Mysore: http://www.myulibnet.org.in/mul.html
21. Postgraduate Institute of Medical Education and Research, Chandigarh: http://www.nic.in/chandigarh
22. Punjabi University: http://www.pbi.ernet.in
23. University of Roorkee: http://www.rurkiu.ernet.in

24. Sri Ramachandra Medical College and Research Institute
http //www hostindia com/SRM
25 Visva Bharati: http //www vbharat ernet in

Jamaica

1. University of Technology, Jamaica http //www ns utech edu jm

Kenya

1. University of Nairobi http //nyati uon ac Ke/

Mauritius

1. University of Mauritius http //www uom ac mu/

Mozambique

1. Eduardo Mondlane University http //www uem mz

Pakistan

1. Aga Khan University http //www akunet org *and* http //www aku edu
2. Bahauddin Zakariya University http //www brain net pk\~vebzu
3. Ghulam Ishaq Khan Institute of Engineering Sciences and Technology
http //giki edu pk
4. Lahore University of Managment Sciences http //www lums edu pk
5. Shaheed Zulfiqar Ali Bhutto Institute of Science and Technology
http //www szabist edu pk
6. Sir Syed University of Engineering and Technology http //www ssuet edu pk
7. Ziauddin Medical University
http //www geocities com/College Park/7329/index html

Papua New Guinea

1. University of Papua New Guinea http //www upng ac pg
2. Papua New Guinea University of Technology http //www unitech ac pg

South Pacific

1. University of the South Pacific http //WWW USP AC FJ

Sri Lanka

1. University of Colombo, Sri Lanka http //www cmb ac lk
2. University of Kelaniya, Sri Lanka http //www kln ac lk
3. University of Moratuwa http //www mrt ac lk

Uganda

1. Uganda Martyrs University. http //www fiuc org/uma/umus htm/

West Indies

1. University of the West Indies. http //www uwimona edu jm

Zambia

1. University of Zambia. http //www zamnet zm/unza/unza html

APPENDIX III

E-MAIL ADDRESSES

Bangladesh

1. Bangladesh Agricultural University: (general) bau@driktap.tool.nl
2. Bangladesh University of Engineering and Technology: librarian.buet@driktap.tool.nl *and* buetlib@bd.drik.net
3. Bangladesh Open University: (general) bou@driktap.tool.nl; (VC) aminul@bangla.net *and* bou_vc@bangla.net
4. University of Chittagong: (VC) vc-cu@spctnet.com
5. University of Dhaka: duregstr@bangla.net
6. International University of Business, Agriculture and Technology: (general) iubat@bangla.net
7. Jahangirnagar University: ju@bangla.net
8. Khulna University: ku@bdonline.com
9. North South University: (general) sysadmin@nsu.agni.com; (VC) hgav@nsu.agni.com
10. University of Rajshahi: rajucc@citechco.net
11. Shahjalal University of Science and Technology: (VC) hrahman@SUST.agni.com

Botswana

1. University of Botswana: (VC) Sivertss@noka.ub.bw

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1. University of Brunei Darussalam: (VC) abak@ubd.edu.bn

Ghana

1. University of Cape Coast: (general) univghana@globalnet.co.uk *and* csucc@ghana.com; (VC) vcucc@ghana.com
2. University for Development Studies: UDS@ug.gn.apc.org *and* univghana@globalnet.co.uk
3. University College of Education of Winneba: UCEWLIB@UG.GN.APC.ORG
4. University of Ghana: E-mail: univghana@globalnet.co.uk
5. University of Science and Technology, Kumasi: univghana@globalnet.co.uk *and* ustlib@ust.gn.apc.org

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4. Amravati University: amuni@mah.nic.in
5. Andhra University: aulibra@md2.vsnl.net.in
6. Anna University: annalib@sirnetm.ernet.in
7. Annamalai University: (VC) au_mgm@hotmail.com

8. Avinashilingam Institute for Home Science and Higher Education for Women: (VC) devunity@giasmd1.vsnl.net.in
9. Banaras Hindu University: (general) root@banaras.ernet.in; (VC) hgautam@banaras.ernet.in
10. Banasthali Vidyapith: DS@bv.ernet.in
11. Bengal Engineering College: (general) root@becs.ernet.in; (VC) director@becs.ernet.in
12. Berhampur University: (VC) VC@pburuav.ernet.in
13. Bharathiar University: (general) regr@as250.bharathi.ernet.in; (VC) ilango@as250.bharathi.ernet.in
14. Bharathidasan University: (VC) VC@bdu.ernet.in
15. Bharati Vidyapeeth: bharati@giaspn01.vsnl.net.in
16. Bhavnagar University: (VC) vidyut@bhavuni.ren.nic.in
17. Birla Institute of Technology, Ranchi: birlatech@bitsmart.com *and* birlatech-ranchi@dartmail.dartnet.com
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21. Central Institute of Higher Tibetan Studies: (VC) directorcihts/varanasi@dartmail.dartnet.com
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36. University of Health Sciences, Andhra Pradesh: UHSAP@REN_NIC_IN
37. Hemwati Nandan Bahuguna Garhwal University: (VC) VC@ugrh.ernet.in *and* VC@hnbgugrw.ren.nic.in

38. Himachal Pradesh University: HP.UNIVERSITY@x400.nicgw.nic.in
39. University of Hyderabad: (formula) Username@UOHYD.ERNet.in
40. Indian Agricultural Research Institute: rbsbic.iari@dbt.ernet.in
41. Indian Institute of Population Studies: (general) iips@bom3.vsnl.net.in; (VC) khpathak@giasbm01.vsnl.net.in
42. Indian Institute of Science: regr@admin.iisc.ernet.in; (academic) username@dept.iisc.ernet.in; (administration) username@admin.iisc.ernet.in
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44. Indian Institute of Technology, Delhi: (VC) director@netearth.ernet.in
45. Indian Institute of Technology, Kanpur: rcm@iitk.ernet.in
46. Indian Institute of Technology, Kharagpur: Director@hijli.iitkgp.ernet.in
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48. Indian School of Mines: (formula) cme@ismine.ernet.in
49. Indian Statistical Institute: dean@isical.ernet.in
50. Indira Gandhi Institute of Development Research: Postmaster@agni.ernet.in
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63. Kota Open University: root@KOU.raj.nic.in
64. Kurukshetra University: kuru@doe.ernet.in
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69. Manipur University: manipur@shakti.ncst.ernet.in
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79. Punjabi University: (VC) puar@pbi.ernet.in
80. Rajasthan Agricultural University: (general) root@raub.raj.nic.in; (VC) vc@raub.raj.nic.in
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82. University of Roorkee: (VC) uorvc@rurkiu.ernet.in
83. School of Planning and Architecture: (e-mail formula) line@SPA.ernet.in
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91. Visva-Bharati: (general) root@vbharat.ernet.in; (VC) dksinha@vbharat.ernet.in

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4. Ahmadu Bello University: (VC) vc@abu.edu.ng
5. Bayero University: root@bayero.edu.ng
6. Federal University of Technology, Akure: root@futa.edu.ng
7. Federal University of Technology, Owerri: root@futo.edu.ng
8. University of Ibadan: LIBRARY@KDL.UI.EDU.NG
9. University of Jos: (general) unijos@aol.com *and* mailbox@unijos.edu.ng; (VC) vc@unijos.edu.ng
10. University of Nigeria: MBC.NN@AOL.COM
11. Obafemi Awolowo University: *omohr@oauife.edu.ng*
12. University of Uyo: (general) root@uniuyo.edu.ng; (VC) vicechancellor@uniuyo.edu.ng

Pakistan

1. Aga Khan: (VC) cvellani@akuc.edu; (e-mail formula) username@akuc.edu
2. University of Agriculture, Faisalabad: agf@paknet1.ptc.pk
3. Allama Iqbal Open University: uunet!nabe!aiou!halleo
4. Bahauddin Zakariya University: registrar@zakaria.hsn.nabe.uunet
5. University of Engineering and Technology, Taxila: (general) uett!root%nabe@uunet.uu.net; (e-mail formula) uett!name%nabe@uunet.uu.net
6. Ghulam Ishaq Khan Institute of Engineering Sciences and Technology: *Rector@giki.nbnpk.undp.org*
7. Institute of Business Administration: ibakhi@hirani.erum.com.pk
8. Islamia University, Bahawalpur: (VC) VC%all.IB%nabe@a.u.net.uu.net

9. Mehran University of Engineering and Technology: (VC) *armemon@vc@muet.its.supet.net.pk*
10. N. E. D. University of Engineering and Technology: (VC) VC@ned.edu.pk *and ned@paknet3.ptc.pk*
11. University of Peshawar: REGISTRAR%PUCLIB@PWR.SNDP.X.UNDP.PRG *and nahe%pup!rgstr@sunet.su.net*
12. Shaheed Zulfiqar Ali Bhutto Institute Of Science and Technology: (general) *info@szabist.edu.pk*; (president) laghari@hirani.erum.com.pk; (e-mail formula) *surname@szabist.khi.sdnpk.undp.org*
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14. Ziauddin Medical University: *zmu@khi.compol.com*

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